GENERAL PURPOSE INPUT BOARD FOR A TOUCH ACTUATION

PRIORITY AND CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation in part of and claims priority from U.S. patent application Ser. No. 10/946,909 filed on Sep. 21, 2004.

TECHNICAL FIELD

[0002] This invention generally relates to electronic touch-devices and more specifically to a touch actuation in an electronic device using a general purpose input board.

BACKGROUND ART

[0003] Presently, switchcovers of a given phone (e.g., a mobile phone) type mostly differ in their appearance whereas a number, positioning and a type of input devices is similar for most of the switchcovers due to construction of a UI (user interface) board. Typically, the input board contains contact pads at positions corresponding to keys on a keymat. Each pad is essentially the size of the corresponding key. As the key is depressed, its conductive lower surface short-circuits the two wires on the contact pad. The pad can also utilize capacitive or force sensing technology for detecting a keypress.

[0004] The reason for using metal or rubber domes as switches is that they give tactile feedback of a key activation to a user. It is also possible to use so called membrane switches, which are thin, but do not give tactile feedback. U.S. Pat. No. 5,374,449, "Monolithic Piezoelectric Structural Element for Keyboards and Method of Manufacturing", by A. Buhlmann et al. discloses how piezo-electric components can be used to replace membrane switches on a flat keyboard. EP Patent Application No. 1 197 835 A2 "User Interface Device", by A. R. Bick, published Apr. 17, 2002, discloses a keypad, where a capacitive matrix touch-device, capable of detecting the position of a finger, is disposed under the keypad comprising conventional switch keys.

[0005] Whichever switch type is used, a number of the keys and their positioning on conventional switchcovers are limited by the pads on the input board. Indeed, the choice of the input devices is limited to the keys only.

[0006] A free placement of the input devices could be implemented with so called smart covers. The problem is that the covers need to be wired, which makes them more complicated and expensive. Also, to ensure the stability of the phone, it is better to have all the electronics on the engine.

[0007] One possible way to vary the input device arrangement of switchcovers is to use so-called push-through keys, as disclosed in U.S. Pat. No. 6,492,978, "Keyscreen", by D. G. Selig et al.; US Patent Application No. 2003/0098854, "Integrated touchscreen and Keys in Same Matrix", by E. R. Laliberte, published May 29, 2003; and U.S. Pat. No. 6,636,203, "Keyboard Equivalent Pad Overlay Encasement for a Handheld Electronic Device", by Y. K. Wong et al. Here a touch-device is overlaid with a cover or with an unfolding flap equipped with keys. As the key is pressed (with a stylus or a finger) an actuator on its lower surface makes a contact with the touch-device thus providing a signal of a key activation. The key is identified by the detected contact position. Such push-through key is used in, e.g., the Sony-Ericsson P800 smart phone.

[0008] A resistive touch-device (e.g., a touch-screen) is sensitive to a touch of any actuator, but it can detect the position of only one contact at a time. Consequently, the keymat has to be supported above the touch-device, so that nothing touches a top membrane of the touch-device while the keys are in the up-position. This tends to result in a thick construction. If a capacitive touch-screen is used, the keymat can rest on a top of the touch-screen. However, the power consumption of a capacitive touch-device is higher.

[0009] Furthermore, there is a visual ergonomics problem associated with the present resistive touch-screens. They consist of two transparent resistive electrodes, one on the base substrate and the other on a film which is separated from the base substrate by an air-gap. The problem is that each air-material interface creates a light reflection which deteriorates image quality: the film adds two extra reflections. Another problem is that the accuracy of the resistive touch screens is determined by the linearity of resistance of the undersurface of the film. The material (usually Indium Tin Oxide, ITO) tends to develop cracks as the film is bent, especially at the edges of the touch screen, causing non-linearities in the resistance.

DISCLOSURE OF THE INVENTION

[0010] According to a first aspect of the invention, a method for providing an actuator identity signal using a general purpose input board, comprises the steps of: moving an actuator, by applying a manipulation signal to an actuator, to make a physical contact with the general purpose input board; and generating an actuator identity signal for providing the predetermined command, wherein the actuator identity signal is indicative of a location of the actuator on a surface of the general purpose input board and optionally indicative of a force imposed by the actuator on the general purpose input board and wherein the general purpose input board contains on the surface of the general purpose input board N conducting lines parallel to each other and electrically isolated from each other, and contains beneath the surface of the general purpose input board K further conducting lines parallel to each other and electrically isolated from each other and from the N conducting lines, the K further conducting lines being perpendicular to the N conducting lines, and wherein each of the K further conducting lines has N-1 contacts extending to the surface of the general purpose input board having one such contact of the N-1 contacts between any two of the N parallel conducting lines, wherein N and K are integers of at least a value of two.

[0011] According further to the first aspect of the invention, the manipulation signal may be applied by a user.

[0012] Further according to the first aspect of the invention, the actuator and the general purpose input board may be parts of an electronic device. Further, the electronic device may be a wireless portable device, a mobile communication device or a mobile phone. Still further, the manipulation signal may be applied by a user of the electronic device by a way of a mechanical touch using a stylus or a finger. Yet still further, the manipulation signal and the